Recent works in Cambridge

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Introduction

IN spite of an estimated population of 96,000, which includes approximately 9,000 undergraduates of the University, and a total rateable value of £5,155,780, the City of Cambridge is still a non-County Borough having an area of 10,060 acres. The City Council do not therefore exercise the autonomous control that might otherwise be expected. When the planning of the City is considered other important aspects arise since the functions of the Planning Authority—except those delegated by statute—are carried out by the Cambridgeshire County Council. In addition the 'Chancellor, Masters and Scholars of the University', acting as a corporate body, together with the individual colleges, each being a self-governing corporate body, have very definite views on the future of Cambridge, as do also the Preservation Society and the recently formed Civic Society. While there is general agreement that the basic aim of the Development Plan is that Cambridge shall remain predominantly a University town there are a variety of opinions as to how this should be achieved.

Although in its modern form the name 'Cambridge' does not indicate Roman connections, the town existed in those times and was on the road linking Colchester with Godmanchester. The town owes its existence to the river crossing and the fact that it was a natural marketing centre for a fertile agricultural area. Over the centuries these two facts have increased in importance and today the town is regarded as a regional centre by upwards of 250,000 people.

In 1946 the City Council and the University decided to appoint Professor (now Sir William) Holford to advise on the future planning of Cambridge. When, as a result of the Town and Country Planning Act, 1947, the County Council became the Planning Authority, they took over the appointment and in 1950 the Holford Report was published. Many of the recommendations made in this Report were embodied in the Town Map submitted to the Minister and subsequently approved in 1954.

Highways

Holford appreciated that if the market town and pedestrian character together with the architectural form of the central area was to be safeguarded, then a relief road should be constructed to the east of the existing spine (A.604) to connect with an improved cross town route. It was envisaged that these two roads would become the boundary of a precinct containing the old town centre and that the reduction in traffic would markedly raise the standard of environment.

Both these roads were included in the Town Map and at the First Review the advisability of their early construction was demonstrated by Messrs R. Travers Morgan and Partners, the Consulting Engineers who had been invited by the Planning Authority to give a second opinion on the traffic proposals.

Recently the Minister of Transport has indicated that he is prepared to include in the classified roads grant programme for 1965/68 that part of the inner relief road between Histon Road corner and Jesus Lane. This section, shown by a solid line on Fig. 1, will include a new bridge over the river and the intersection with Chesterton Road (A.45) is being designed so that grade separation can subsequently be embodied. The detailed design of the work is being undertaken and it is estimated that the cost—excluding grade separation—will be £470,000.

When this road has been constructed it will be possible to obstruct physically the existing spine road in the vicinity of Magdalene Bridge and so prevent its use by the local through traffic. This traffic which has business in Cambridge but not in the centre is calculated from survey material to be 30% of the total movements entering the centre.

A major building project on a site adjoining the cross town route enabled an improvement to the junction of Emmanuel Street with St. Andrew's Street to be carried out at a cost of £11,000 (Figs. 2 and 3). The continuation of the improvement line along Emmanuel Street necessitates setting back the Porter's Lodge and ornamental railings to the North Court of Emmanuel College. This has been agreed by the College and it is anticipated that the works will soon be started.

While affording little relief to traffic in the central area the proposal having the highest priority is that known as the Chesterton Bridge Route. When completed it will provide an improved route to the east of the central area with an important link between A.10 and A.45. Both these are trunk roads and in 1962 the Minister of Transport announced that the northern section between A.10 and A.45 (shown by the

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Fig. 1. Principal roads and car parks.

solid line on Fig. 1) had been included in his programme of works which were to be started during the next five years.

The southern section of the route utilises existing single carriageway roads but dual carriageways will be required to provide sufficient capacity for the ultimate traffic flow. The City Council are undertaking the comprehensive redevelopment of a residential area having a frontage to this part of the route and a section of the dual carriageway is already completed. Ultimately it is proposed to incorporate grade separation at the major intersections.

A serious bottleneck to traffic using the southern section of A.604 occurred at the bridge carrying the road over the main Cambridge to London railway. At the crown of this bridge the carriageway width was only 21 ft and since British Railways were contemplating reconstruction it was decided by the City and County Councils, aided by a 75% grant from the Ministry of Transport, to enter into an agreement to secure a much needed improvement. The new bridge is 60 ft between parapets and accommodates two carriageways each 20 ft wide with a 4 ft central reservation.

The bridge deck consists of precast prestressed concrete beams each 18 in wide, 31 in deep and 72 ft long. Except for those periods at night when the new beams were being lifted into position two-way traffic flow was maintained. Included in the total cost of £127,000 are improvements to the junctions of side roads at the ends of both approaches.

In 1960 a new bridge replacing the existing Garret Hostel bridge over the river was given to the City by members of the Trusted family in recognition of their association with Trinity Hall. With a high arched profile and a clear span of 80 ft the new bridge (Fig. 4) has opened up the view along the river, and with a width of 14 ft has provided an attractive viewpoint in the middle of the 'Backs'

Structurally the new bridge is a hinged portal frame of reinforced concrete supported by cased concrete raking piles driven through the peat and mud into the underlying gault clay to a depth of 40 ft. The transom, which is the only visible part of the bridge, has a 'winged' cross-section prestressed by longitudinal post-tensioned cables and incorporates twin plastic water mains at the neutral layer. Its doubly curved soffit has been tooled to expose the Cornish granite aggregate. The deck is paved with York stone and the handrailing is of satin polished bronze.

The architectural design was by Mr Guy Morgan, F.R.I.B.A., and Mr Timothy Guy Morgan, while Messrs

J. L. Kier and Co. (London) Limited were the structural engineers and main contractors.

Traffic management and parking

An active policy of traffic management and parking has been pursued by the City Council for a number of years. The one-way street system for the central area came into operation in 1945 and was designed to discourage through-traffic, improve the flow of vehicles having business in the central area and to make pedestrian movement safer. Subsequently it became necessary to impose no-waiting restrictions in certain streets and this has culminated in the Controlled Parking Zone coming into operation in April of this year.

A total of 179 meter spaces have been provided in the inner area where the charges are sixpence for half an hour with a maximum permitted time of one hour, and a further 268 spaces are in the outer area where the charge is reduced to sixpence for one hour with a maximum permitted time of two hours. It is estimated that the annual running costs, including loan charges, will be £14,500 with a possible income of £22,700.

Surface car parks for public use provide a total of 1,190 spaces and charges are made in respect of 580 of these, the remainder being free. Some of these car parks are temporary and will disappear when redevelopment is undertaken. Others will be replaced by either multi-storey or underground parks and new sites are to be established (Fig. 1).

The multi-storey car park at Park Street, providing 319 spaces, was opened in October, 1963, although the City Council had first agreed to this proposal in 1956. Apart from the design and construction period of two years the remainder of the time was taken up by two Public Inquiries, one concerning the Town Planning aspect and the other the Compulsory Purchase Order, with a reference to the Magistrate's Court between the two Inquiries. At the Magistrate's Court the appellants were successful and their land was excluded from the proposed car park leaving an irregular and awkward shape to be dealt with (Fig. 5).

Eventually, after the design had been submitted to the Royal Fine Art Commission, the tender in the sum of £153,907 was accepted and site operations began in 1962. Sub-soil conditions are such that a piled foundation was necessary; this comprises 162 reinforced

Fig. 2. Emmanuel Street before improvement.

Fig. 3. Emmanuel Street after improvement.

Fig. 4. The new Garret Hostel bridge.

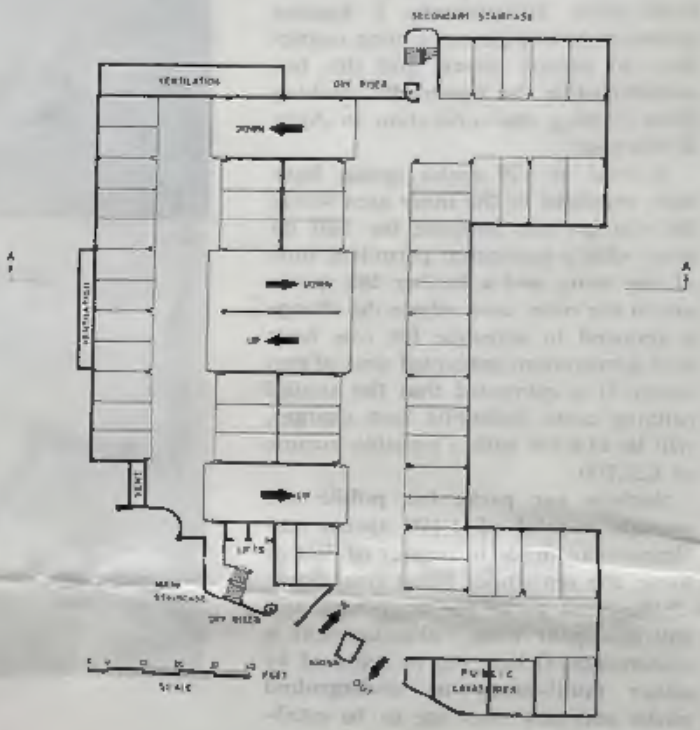


Fig. 5. The layout of Park Street multi-storey car park.

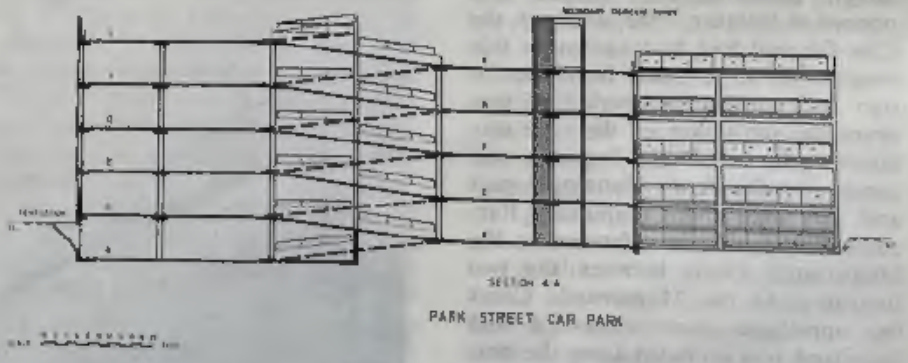


Fig. 6. A sectional view of Park Street multi-storey car park.

concrete piles, each being of 20-in diameter and 38 ft long, cast in situ after boring by auger.

The construction of the main frame is in situ reinforced concrete with 12-in square section columns supporting 6-in floor slabs embodying integral beams 12 in deep. Floor to floor height is 8 ft resulting in a headroom of 7 ft (Fig. 6).

Externally the architectural treatment to the road elevations of the car park consist of vertical fins in precast concrete having a triangular cross-section with a 5-ft high screen wall at ground floor level faced with Weldon stone (Fig. 7). At the obtuse angle formed by the intersection of the two roads a re-entrant curved concrete wall is introduced and this is faced with large Norfolk cobbles.

Street lighting and furniture

Some twelve years ago the City Council embarked upon a programme for the replacement of the gas lamps by electric lighting. In the historic centre it was decided that a special form was required and a design prepared by the late Professor Sir Albert Richardson was accepted. This provided for four 80W vertically mounted fluorescent tubes 5 ft long to be enclosed in a translucent cylinder surmounted by a bronze cap and supported on a bronze fluted cylindrical column, or wall mounted in certain circumstances. In view of the famous street scenes the siting of these lamps was agreed with the Royal Fine Art Commission.

Elsewhere in the central area horizontally mounted fluorescent lighting has been adopted while sodium

lighting, using 25-ft steel columns, is used for the main traffic routes. Where major road improvements make it practicable it is now the policy to use 200W sodium lamps mounted on 35-ft steel columns.

In the residential area a slender hexagonal aluminium column supporting an inclined lantern housing two 40W fluorescent tubes is being used and it is anticipated that the conversion will be completed in 1965.

So as not to detract from the visual amenity of the central area great care was taken when selecting the type of bus shelter and litter basket to be used, and Fig. 8 shows the designs which were accepted.

Main drainage

Since 1953 considerable attention has been paid to main drainage works. To set the scene for these a reference to the historical background is desirable.

The first sewer may be said to date from 1215, when on the orders of King John a fortification known as the King's Ditch was constructed. This came to be used as a drainage ditch, and together with many smaller branch ditches which were constructed later, was ultimately culverted and formed part of the sewage system. Although parts of the King's Ditch remain to this day they are now, however, purely of antiquarian interest. It is interesting to note at this point that the original purpose of the famous 'Hobson's Channels' which flow down the sides of Trumpington and St. Andrew's Streets was to provide a flushing system for the King's Ditch.

This early system of foul sewers with numerous independent outfalls to the River Cam continued to develop until the last decade of the 19th century when a completely new system, designed on the partially separate principle, was constructed together with a pumping station and sewage farm. In general all foul sewage was collected in the new sewers, the old ones continuing to carry surface water.

Soon after Mr Burrows' appointment to Cambridge in 1945 it became apparent that major improvements to the sewerage system were overdue (owing to the restriction on such works during the wartime and immediate post-war years). A complete survey and investigation into both the foul and surface water systems was put in hand. The analysis of this survey revealed serious overloading and indicated where relief was necessary. It might be noted here that it is the short duration high intensity thunderstorms

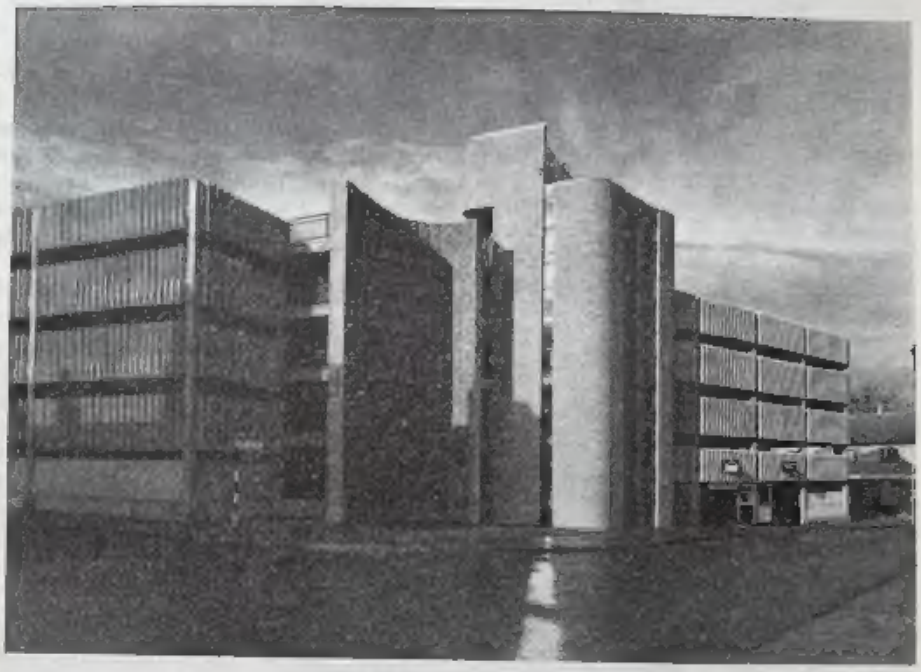


Fig. 7 Exterior of Park Street multi-storey car park.

Fig. 8. Examples of bus shelters and litter bins used in Cambridge.

to which Cambridge appears to be particularly susceptible that cause the biggest problems, intensities of over 3 in/h being not uncommon. Foul sewer calculations were put in hand first, and the Ministry of Health and Crimp and Bruges flow formulæ were adopted throughout. When work began on the surface water design, however, the Blair formula was felt to be more suitable.

Surface water sewers

From the historical remarks it will be appreciated that in the case of the surface water sewers, their age necessitated replacement as much as the need for additional capacity. In general they still had separate outfalls and schemes could thus be put in hand independently (Fig. 9) although some revision of drainage areas was found desirable. In all cases the design and construction was orthodox apart from the use of headings at a depth of only 10 ft to invert level in the central area to reduce disturbance to traffic.

All the surface water schemes have now been carried out with the exception of that in East Road which will be laid in conjunction with a new trunk foul sewer.

Oil pollution

From a review of the operation of both old and new surface water sewers and of the problems of river pollution it is apparent that whilst the use of modern paved highways may have resulted in an improvement in the quality of surface water discharges, the intensity of present day motor traffic and the use of oil-fired boilers has introduced a new problem with oil pollution. It has been necessary to develop a technique to deal rapidly with instances of such pollution. Knapsack type spraying units with long lances are now located at strategic points within the City together with supplies of emulsifying agents such as 'Gamlen D' or 'Polyclens'. Immediately oil pollution is observed the offending areas are sprayed and when necessary, agitated with a water jet. Concurrently with this work detective action is usually initiated to locate the offender. A policy has been adopted of draining all forecourt areas of blocks of garages or gullies adjacent to fuelling points to the foul sewers. Such measures do nothing to overcome pollution after long dry spells by collections of oil in roadside gullies etc., and there may well ultimately need to be oil trapping facilities on the river outfalls of all surface water sewers.

Foul sewers

Turning now to foul sewers, a complete review of the whole of the City's drainage area was necessary. Surcharge levels in peak storms were recorded in key manholes by means of self recording depth gauges and these results were compared with theoretical overloading figures.

The proposals indicated in Fig. 10 comprised two new trunk sewers to the north and south of the City Centre which would intercept existing main sewers at carefully calculated points to ensure full use, but no overloading of the central area sewers. Further branch sewers from these two, together with a new trunk sewer to the east of the City, provided for the areas where appreciable development had taken place.

The foul sewers reach a depth of approximately 35 ft near the main pumping station and the interconnection of new sewers with the existing main outfall has called for careful thought due to the problem of maintaining the sewage flow. A particularly involved problem arose in the case of the connection of the East Road sewer with the main outfall due to the need to divert the latter around the foundation piles of the proposed Chesterton Bridge. The Assistant in charge has, however, developed a scheme to prefabricate the manhole invert in fibreglass. This unit can be lowered into position at the time of minimum flow and be concreted securely with rapid hardening cement prior to the heavy load of the daily flow being received. This idea may well be capable of development for other junctions.

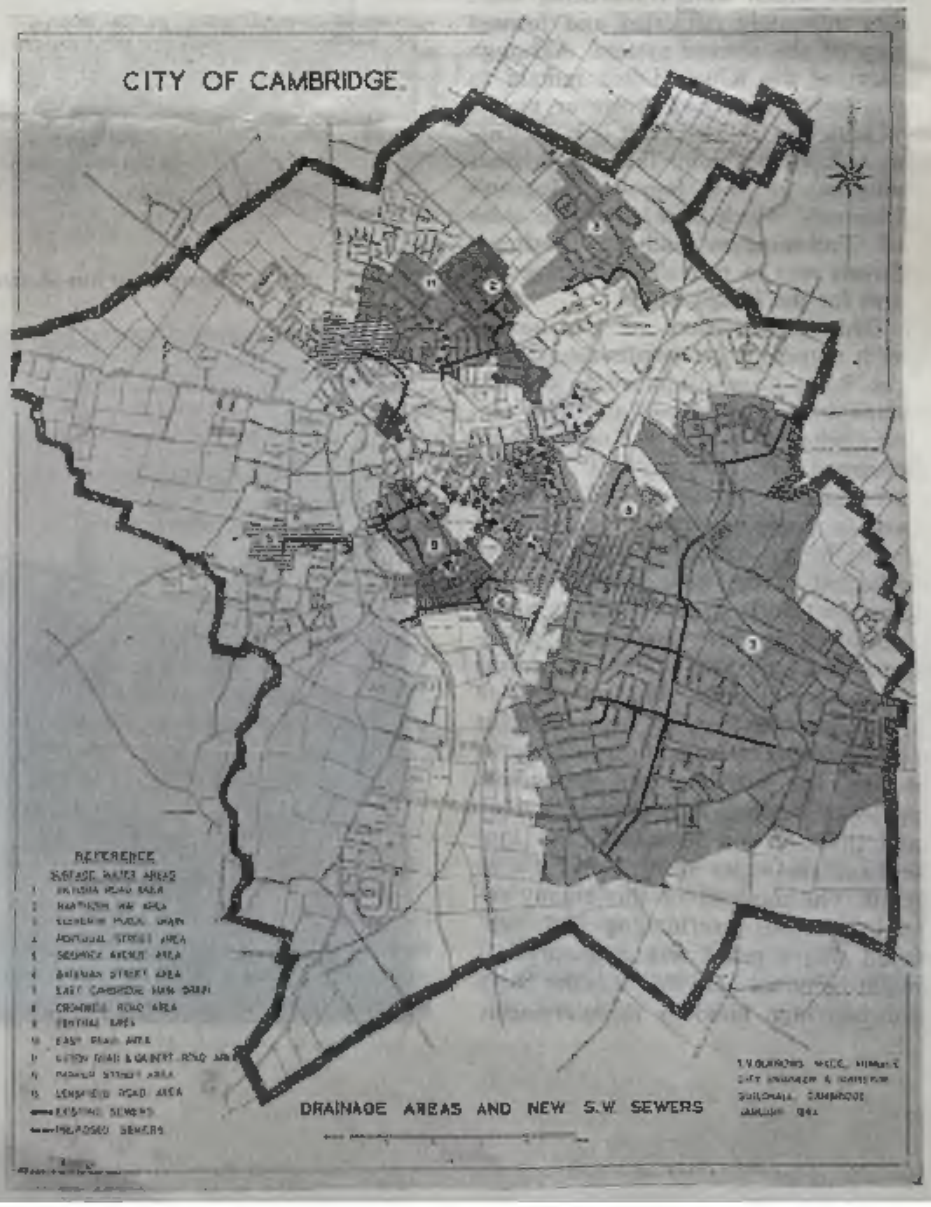
District pumping stations

Since the war six automatic district stations have been constructed to extend the drainage area of the sewage system.

Main sewage pumping station

Whilst the steam engines of the station, which was built in 1895, are still in good condition the pumps are in need of a major overhaul and the station is no longer adaptable to present day requirements. In particular it

Fig. 9. New surface water sewers and their drainage areas.



cannot deal with the high peak flows, despite the addition of supplementary gas and electrically driven pumps. The City Council thus approved the construction of a completely new semi-automatic Riverside Station on a site adjacent to the existing building.

The heavy surcharge on the existing sewers precluded direct measurement of the flow received. Calculations, however, produced the alarming maximum ultimate flow of 18×DWF, which has been adopted for the design. The existing twin 24-in diameter rising mains are capable of carrying 3×DWF and the excess is dealt with in existing stormwater tanks alongside the station, the contents of these being pumped to the sewage works at times of low flow.

Provision is being made in the new station (Fig. 11) for 5 dry weather flow pumps (one being a standby) which will discharge into the rising mains to the sewage works, and 6 storm water pumps (one standby) which are only capable of discharging to the stormwater tanks. These will give a total discharge of 14 DWF, space being allowed for the provision of a further two pumps when required.

As the new station had to be constructed at a depth of approximately 44 ft below ground level and had to ultimately accommodate 13 pumps, careful thought was given to accommodating wet and dry wells with the minimum of excavation and low constructional costs, at the same time giving adequate servicing facilities and a pleasing appearance. The design is thus somewhat unconventional. The wet well consists of a 'tunnel' running the full length of the building, the pumps being located on each side of it (Fig. 11). A 1/19th scale hydraulic model was built to verify the design and freedom from serious vortex problems was indicated.

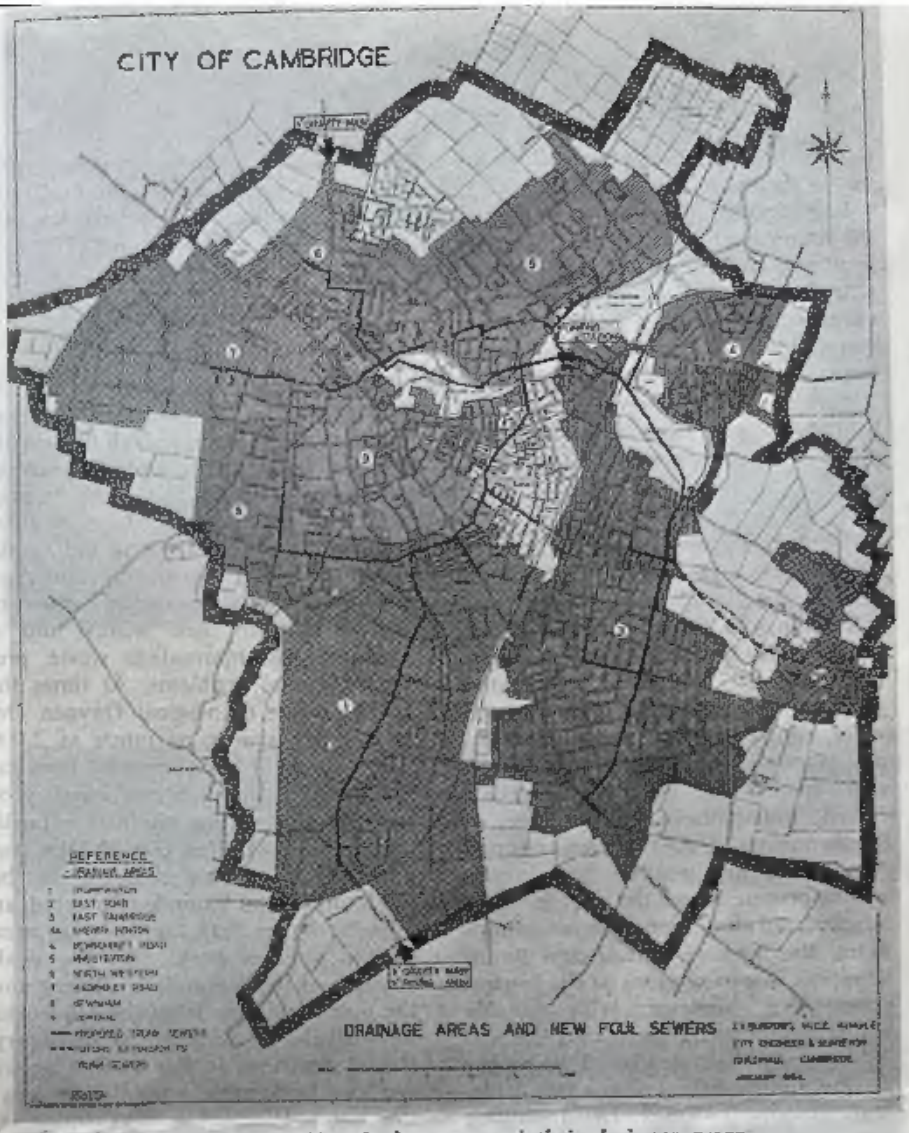


Fig. 10. New foul sewers and their drainage areas.

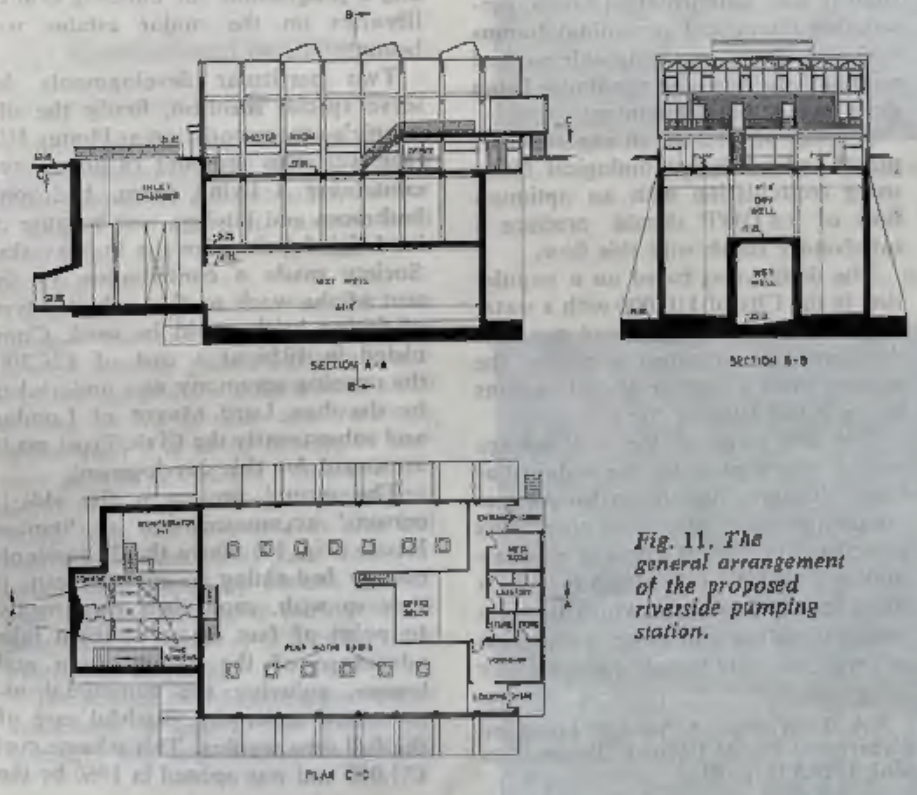


Fig. 11. The general arrangement of the proposed riverside pumping station.

The motor floor of the building has been designed to be above flood level but approximately 4 ft below ground level. This results in a spacious motor hall with generous height for the travelling crane. From the main entrance a visitor can look down on the motor floor from a mezzanine floor located above the control panel. At the same time it permits a pleasing low external appearance.

Fine screens of the Ames Crosta Mills grab type with 1-in clear spacing between bars are located in the inlet chamber and are protected by hoist operated coarse screens. Two Sulzer disintegrators are provided for the

maceration of the screenings which are then returned to the flow.

Considerable thought was given to the removal of grit, but in view of the problems of the separation of this at a depth of approximately 35 ft and the existence of facilities at the sewage disposal works, no grit separation has been provided prior to pumping. A 'Detritor' has however been provided to remove grit from the stormwater prior to discharge into the tanks.

Power supply

As sludge digestion is to be adopted at the sewage disposal works, consideration was given to the generation of electricity to power the main pumping station. Numerous alternative schemes were analysed. The arrangement adopted provides for the joint use of power from the sewage works and from the Eastern Electricity Board, but without the problem of synchronising. Under normal circumstances the dry weather flow pumps will be powered from the sewage works supply and the storm water pumps from the Eastern Electricity Board supply. The two sections of the control board can, however, with suitable safety interlocks, be connected and any of the pumps operated by either supply to the limit of the power available. This system possesses the following advantages:

1. Maximum reliability without the use of normally unused standby equipment.
2. Generating plant does not have to be provided to deal with infrequent peak demands.
3. Maximum use is made of power from the sludge digestion process.

Overload protection equipment based on magnetic amplifiers is to be provided to preclude the switching on of motors if adequate power is not available; at the same time adequate warning will be given to the sewage works power station of impending power demand.

The control of the pump motors is by means of a float-operated drum controller rather than the more conventional independent floats or no-flote equipment. By this means the level intervals between the operation of pumps is limited to 9 in. and adequate running time is achieved without the need for a storage well and the resultant problem of settlement from the grit-laden sewage.

The building is to be located overlooking the River Cam and external appearance has been considered important. The superstructure is largely prefabricated using exposed aggregate panels on a reinforced concrete framing, with lattice steel roof trusses supporting a flat roof with north lights.

Sewage disposal works

Special flow problems

A post-war desire in the adjoining Rural District to improve sewerage facilities led to an approach to the City Council to receive and treat sewage from area adjacent to the City boundary. In particular these areas included a large factory involved in the manufacture of jam, marmalade and fruit preserves. The high organic content of the waste from these works, and in particular the marmalade waste, presented special problems. At times the B.O.D. value (Biological Oxygen Demand) can rise to as much as 2,000 parts per million. At the same time the Eastern Gas Board began a policy of centralisation of gas production facilities, and Cambridge Gas Works was one of the plants selected to be modernised and extended to serve an area far larger than the drainage area of the sewage works. As the peak strength of the marmalade effluent and the maximum flow from the gas works were likely to coincide in February when conditions in the sewage works are least favourable, special consideration had to be given to these problems.

Design of the works

The pre-war works comprised longitudinal flow sedimentation tanks, percolating filters and pyramidal humus tank, but these were only able to deal with half the flow, the remainder being dealt with by land treatment.

A series of tests on an experimental plant* indicated that biological filters using recirculation with an optimum flow of 3×DWF should produce a satisfactory result with this flow.

The design was based on a population in the City of 110,000 with a water consumption of 35 gal/head per day. Agreement was reached to receive the sewage from a further 15,000 persons in the Rural District Area.

The first stage of the new sewage works, which provides for sedimentation, filtration, humus settlement, recirculation and sludge drying, was completed in 1959 at a cost of approximately £500,000. The design is now in hand for the final stage which includes sludge digestion and power generation as well as additional capacity for filtration to deal with an increase in water consumption per head which is now estimated at 42 gal/day. The design is being based on an anticipated flow of 50 gal/head per day. It is proposed to utilise the gas injection method of stirring for the digestion process. An experimental plant which has been operating for some time has confirmed that the design gas output of 0.8 ft³/head per day should be achieved.

The City Council are very conscious of the need for a high standard of effluent in order to preserve the amenity value of the River Cam which is used so extensively for recreational purposes. Consideration is thus being given to incorporating in the final improvements facilities for a 'polishing' of the effluent by employing a method such as grass land treatment, microstrainers or stabilisation ponds. The relative merits of these methods are at present being investigated.

* A. J. Wigley. 'A Sewage Treatment Experiment Plant.' J.Mun.E. Proceedings, Vol. LXXVII, p. 623.

Housing and schools

From 1946 until the City Architect took up his appointment in January, 1963, the Council had built a little over 5,000 dwellings excluding temporary pre-fabs and aluminium bungalows. The permanent dwellings provide a variety of accommodation to suit the housing needs and the buildings range up to 4 storeys in height. In addition, shops with either flats or maisonettes above have been erected on the estates and a programme for building branch libraries on the major estates was begun.

Two particular developments deserve special mention, firstly the old people's accommodation at Honey Hill (Fig. 12). This provides 18 units, each containing a living room, bedroom, bathroom and kitchen, and because of its delightful situation the Preservation Society made a contribution to the cost of the work so that a better type of facing brick could be used. Completed in 1956 at a cost of £26,300, the opening ceremony was undertaken by the then Lord Mayor of London and subsequently the Civic Trust made an award for this development.

The second project is the elderly persons' accommodation at Stanton House (Fig. 13) where the 29 residents occupy bed-sitting rooms and can, if they so wish, cook their own meals. In point of fact many of them take advantage of the dining room and lounge, enjoying the communal atmosphere under the watchful care of the full-time warden. This scheme cost £31,900 and was opened in 1960 by the

Rt Hon Henry Brooke, P.C., M.P., who was then the Minister of Housing and Local Government.

Difficulties encountered in the recruitment of architects to the department in the early 1950s caused the Council to consider the appointment of an achitect in private practice to undertake the redevelopment of the East Road C.D.A. shown in the approved Town Map. David Roberts, F.R.I.B.A., was commissioned to prepare the designs for the area and in 1962 the first stage (Fig. 14) was completed. The second stage is well advanced and upon completion of the whole scheme a total of 230 dwellings will be provided, including six shops and a public house.

During the same period an active programme for the provision of new schools was being followed and a total of eleven were built. These ranged from junior schools at the one end of the scale to a grammar school at the other, and within this range was included one with special provisions for teaching deaf children and another purposely designed for educationally sub-normal children. While the majority of the schools are constructed in the traditional manner two of them, the Grammar School for Boys and the Manor Secondary Modern Schools, embody the Intergrid system using precast prestressed concrete members. During the construction of the Grammar School an Institution visit was arranged so that members could see the principles adopted.

Recreational facilities

The indoor swimming pool

For over 100 years schemes for an indoor swimming pool for Cambridge have been under consideration, but for a variety of reasons it was not until 1963 that this long felt need was satisfied.

The building, which overlooks the famous Parker's Piece open space through double glazed curtained walling, houses a main pool which is 110 ft long by 42 ft wide and varies in depth from 3 ft to 12 ft 6 in. A learners' pool 36 ft by 20 ft with a uniform depth of 2 ft 6 in has also been provided. It is not proposed to give full details of the project as these were presented in a paper by Messrs. Nowell and Wyatt published in the April and May, 1963, issues of *The Chartered Municipal Engineer*.

The scheme posed quite a number of interesting problems on expansion, humidity and corrosive atmosphere as

Fig. 12. Honey Hill elderly people's dwellings.

Fig. 13. Stanton House elderly people's accommodation.

Fig. 14. Flats in the East Road redevelopment area.

well as structural problems. Difficulties in obtaining good quality concrete in the short bored piles led to the feeling that this is a field in which greater research might be undertaken.

Outdoor swimming pools

As part of a policy of improving the standard of its swimming facilities the City Council have modernised two outdoor swimming pools and installed purification equipment. In each case sand filters have been adopted, together with break-point chlorination and pH correction. The turnover of the water has been designed on 4 hours.

In the case of Jesus Green baths the water was previously drawn from the river above the lock and returned below. Use of river water has now been discontinued, any make-up water being obtained from the local supply mains. In addition to the purification equipment and filter houses, the work included major improvements to the pool, which is 300 ft by 40 ft. The bottom was regraded, new scum channels provided and the walls and floor strengthened by pressure grouting. New changing cubicles, a basket store and office have been provided.

The second outdoor pool is at Coldham's Common. Originally this was fed by spring water. Pollution was, however, likely to occur along the supply watercourse and only limited chlorination was possible. As drainage facilities were not available in the area the construction of a pumping station to deal with filter wash water and the effluent from the lavatories was necessary. The conversion to full chlorination and recirculation, where the water previously went to waste, has resulted in a noticeable rise in the water temperature and increased the popularity of the pool.

In addition to the two modern outdoor pools the City Council is also responsible for bathing enclosures on the River Cam. Attention is now being turned to these with a view to modernising the facilities. Whilst there appears to have been some improvement in the condition of the river water, this still leaves something to be desired. It will be interesting to note the effect of the recent improved powers over effluent control.

Paddling pools

Not only have the swimming pools received attention but water purification installations have been provided for the two existing paddling pools. It is felt that ensuring safe conditions for the young is of particular importance. The pools are of concrete construction with paved surrounds. Due, however, to the close proximity to grass areas a heavy pollution load is experienced. The installations both comprise sand filters with break point chlorination and provision for a four-hour turnover period.

The design is now in hand of a third paddling pool to serve a developing area of the City. In this instance good quality spring water is available and no treatment will be necessary.

Other recreational facilities

In the provision of recreational facilities the City Council have cared for all ages of the population. Three five-rink bowling greens have been provided in the new housing areas. Tennis facilities have been increased and improved, and two new recreation grounds provided.

With all facilities such as bowls, tennis, football etc, there is the recurrent problem as to whether they should be located where the people live or be grouped in centralised positions. Whilst the former is often preferable for the players, the latter facilitates expert maintenance and reduces costs, apart from reducing damage by vandalism. With all the works referred to above a policy of decentralisation has been adopted.

For children the emphasis has been on adventure playgrounds, four of which have been established. With these, traditional swings and similar equipment have given way to tree logs, pipes and mounds of earth. A significant move has been the setting up by local residents of Children's Playgrounds Associations which are advocates of the adventure type of playgrounds and they are eager to assist the Council in the planning of them.

Amenities

Despite its priceless heritage of open spaces, comprising some 226 acres of common land and 224 acres of recreation grounds, the City Council continues to add to this total. A feature of recent years has been the trend to establish areas as nature reserves where the natural flora may be protected and appreciated by the public. One disused chalk quarry has been treated in this manner, and an area of 5 acres of riverside land is to be taken in hand next year. Another chalk quarry of approximately 10 acres is under consideration. In all these cases the Naturalists' Trust has shown an active and helpful interest, and in the last mentioned proposal consideration has been given to providing a resident warden. The policy has been to preserve, encourage and if necessary supplement the existing trees, the undergrowth being controlled to provide access, but at the same time protect any peculiarities of natural flora.

The inevitable naked appearance of housing areas developed in treeless fields has led the Council, with the cooperation of the Civic Trust, to experiment with the establishment of semi-mature trees of up to 40 ft in height. The results have been most gratifying and the work has received enthusiastic support.

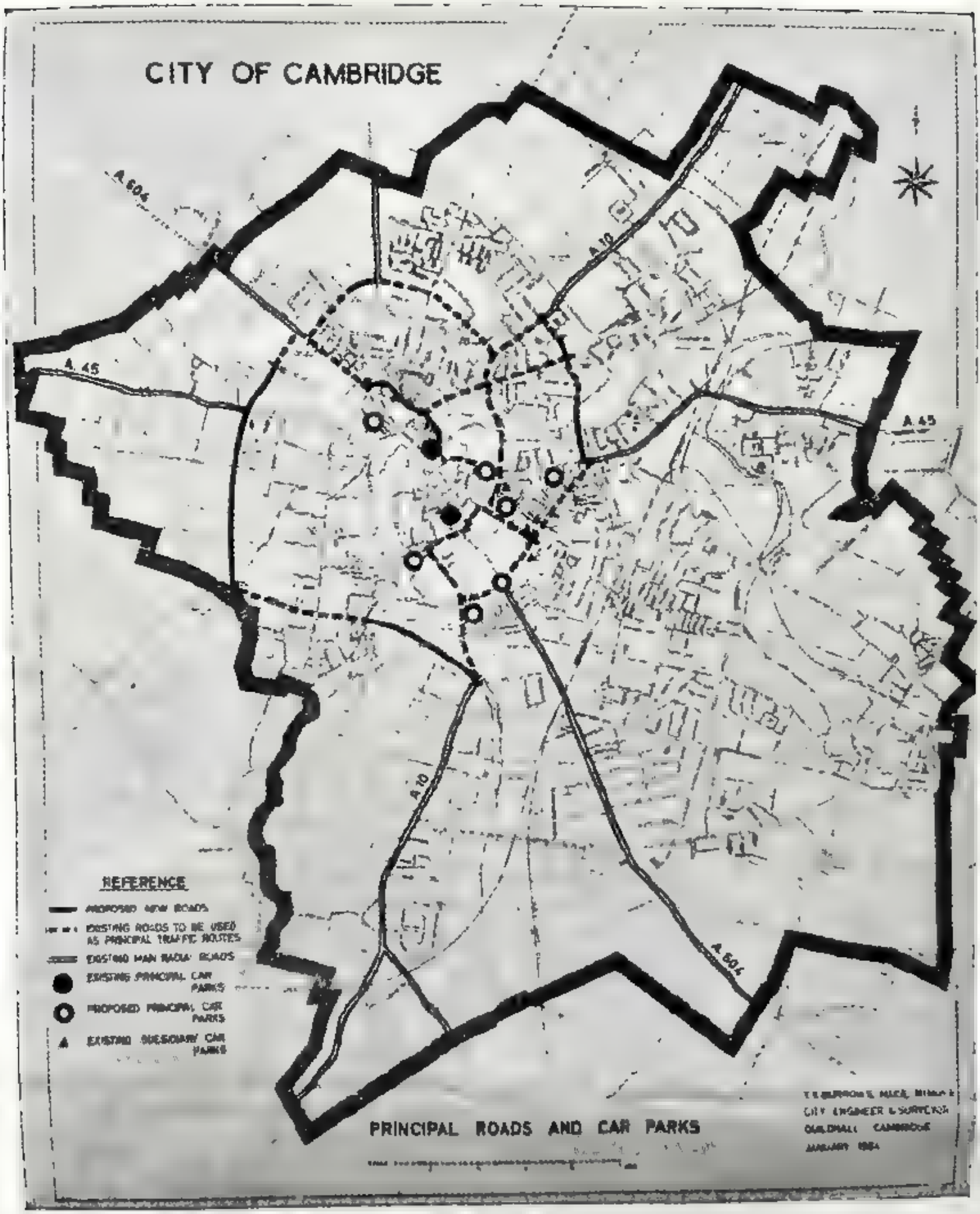
As the Surveyor's Department is responsible for the provision of some 200,000 plants annually for floral displays the establishment and development of a propogation centre in the grounds of Cherry Hinton Hall has been an important aspect of the Department's work. During the next two years it is proposed to spend about £45,000 on new greenhouses, equipment stores and other improvements At the same time the grounds and lakes of the old hall are being restored to their former beauty after years of neglect.

The decline of the country estates has been something of a tragedy for the English countryside, and in its modest way the City Council is shouldering a responsibility for providing and maintaining areas of natural beauty in a similar fashion to that of the former country landlords.

Acknowledgments

The authors of this paper readily admit that the works described—and many more which space restriction prevents being mentioned—have only been achieved as a result of teamwork by all the sections of the department constantly inspired, encouraged and advised by the City Engineer and Surveyor, Mr T. V. Burrows, M.I.C.E., M.I.Mun.E. In addition, the contribution made by the other departments, without whose help many of the proposals would not have reached fruition, must also be acknowledged.

Lastly, but by no means least, particular mention must be made of the enthusiasm shown by all members of the City Council in the work of the department and the aim to make Cambridge an even more delightful place to live in.


CITY OF CAMBRIDGE
A 604
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REFERENCE
PROPOSED NEW ROADS
EXISTING ROADS TO BE USED AS PRINCIPAL TRAFFIC ROUTES
EXISTING MAIN RADIAL ROADS
EXISTING PRINCIPAL CAR PARKS
PROPOSED PRINCIPAL CAR PARKS
EXISTING SUBSIDIARY CAR PARKS
PRINCIPAL ROADS AND CAR PARKS
CITY ENGINEER & SURVEYOR
GUILDHALL CAMBRIDGE
JANUARY 1964

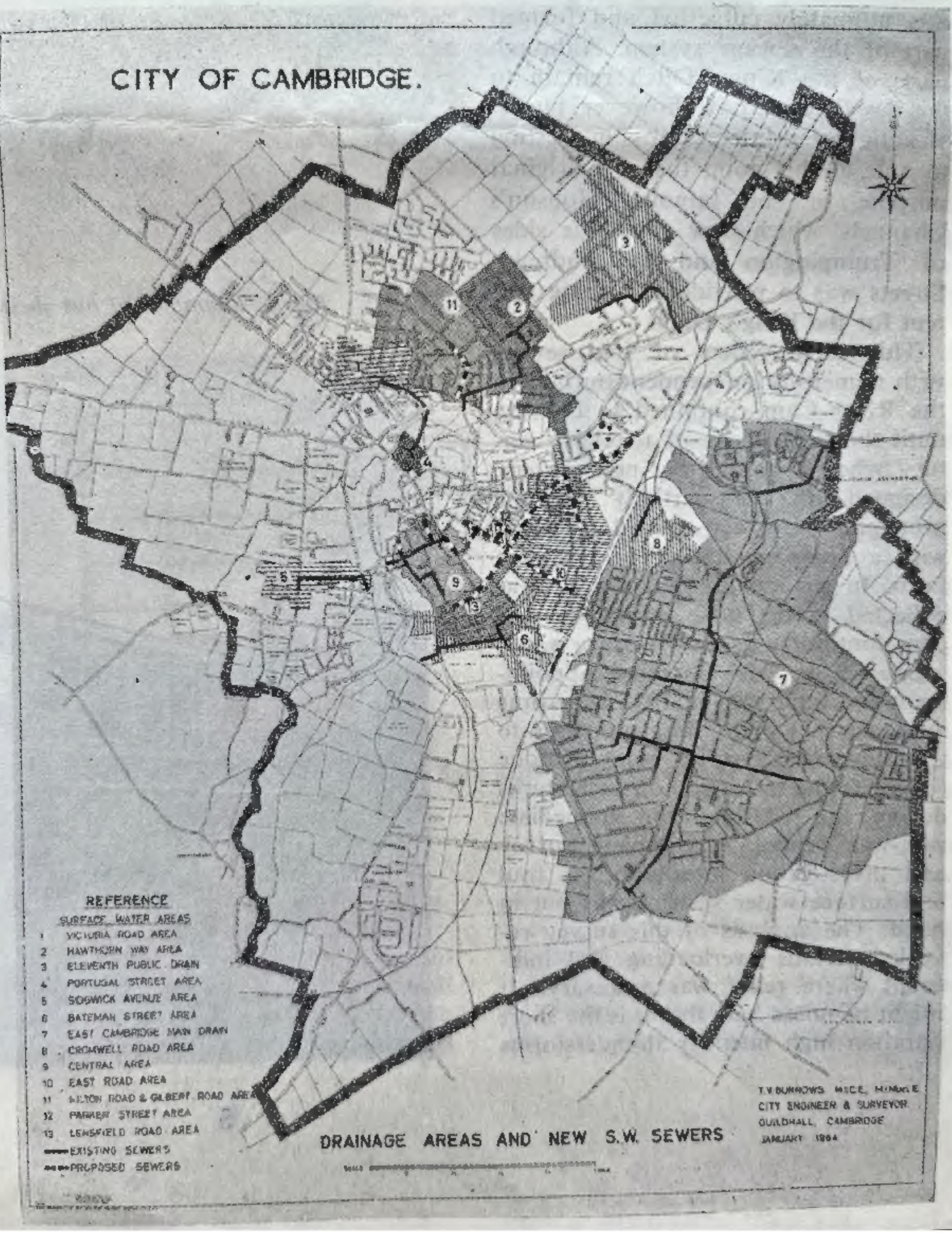
Fig. 2. Emmanuel Street before improvement.

Fig. 3. Emmanuel Street after improvement.

Fig. 7. Exterior of Park Street multi-storey car park

Fig. 8. Examples of bus shelters and litter bins used in Cambridge.

CITY OF CAMBRIDGE.



REFERENCE

SURFACE WATER AREAS

1 VICTORIA ROAD AREA
2 HAWTHORN WAY AREA
3 ELEVENTH PUBLIC DRAIN
4 PORTUGAL STREET AREA
5 SOGWICK AVENUE AREA
6 BATEMAN STREET AREA
7 EAST CAMBRIDGE MAIN DRAIN
8 CROMWELL ROAD AREA
9 CENTRAL AREA
10 EAST ROAD AREA
11 MILTON ROAD & GILBERT ROAD AREA
12 PARKER STREET AREA
13 LENSFIELD ROAD AREA

EXISTING SEWERS
PROPOSED SEWERS

DRAINAGE AREAS AND NEW S.W. SEWERS

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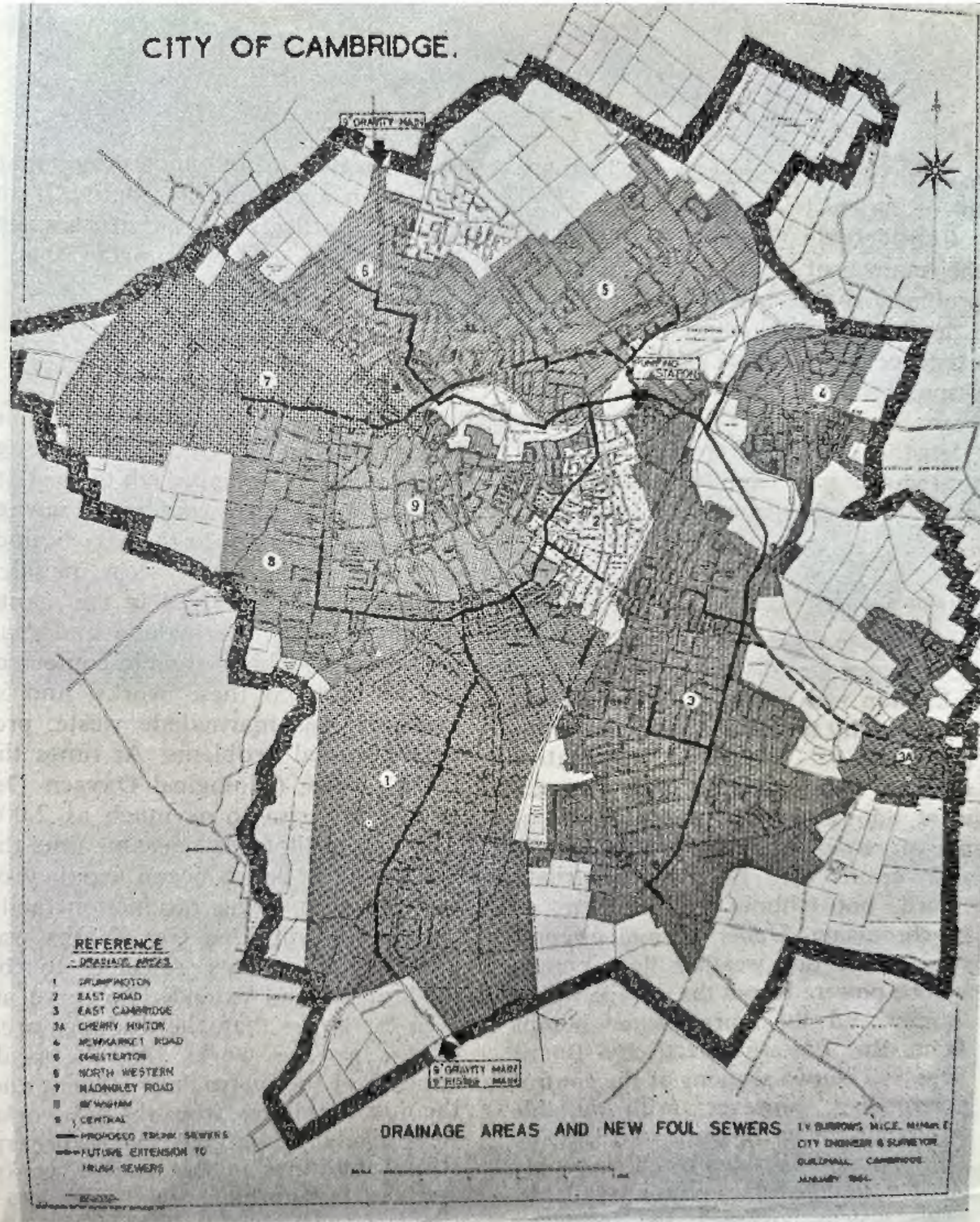
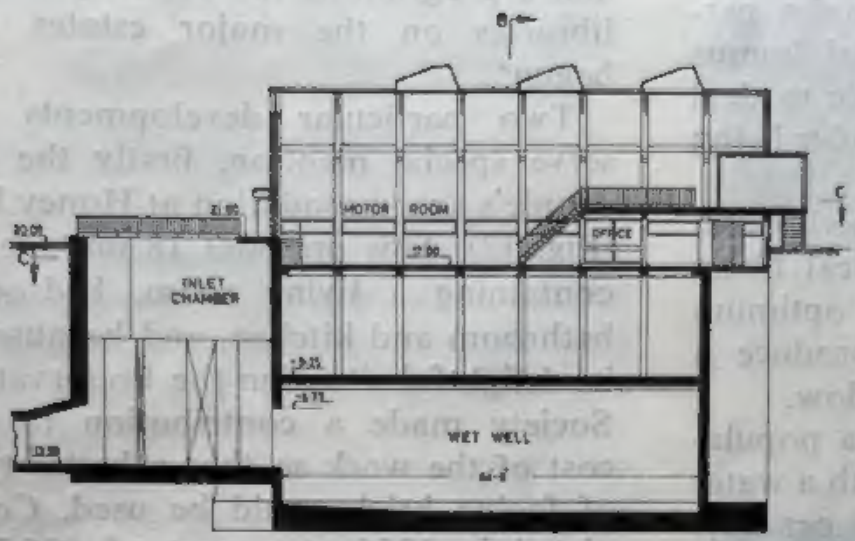
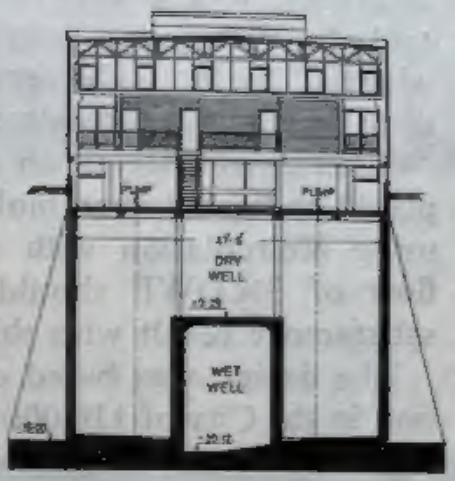


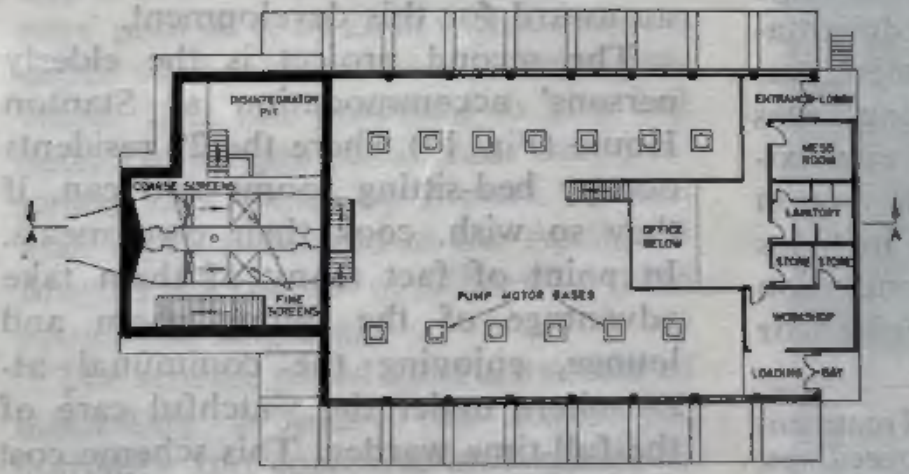
Fig. 10. New foul sewers and their drainage areas.



SECTION A-A



SECTION B-B



PLAN C-C

Fig. 11. The general arrangement of the proposed riverside pumping station.